Notes on the Laboratory Rearing of *Notonecta hoffmanni*

(Hemiptera : Notonectidae)

J. E. McPherson
San Diego State College, San Diego

Notonecta hoffmanni Hungerford is a common back swimmer found in freshwater pools and streams. It occurs in Southern California, Baja California, Mexico, Arizona (Hungerford, 1925), and New Mexico (Sailer, 1942). The only work which has been done on this species, thus far, is an original description of the male and female adults by H. B. Hungerford (1925) and the life history by McPherson (1965). This paper concerns the laboratory rearing of this species.

Materials and Methods

The collection site was a 150-foot-long section of Viejas Creek which is located 3.5 miles east of Alpine, San Diego County, California, at an elevation of 2,230 feet above sea level. Adult specimens were taken from this area in late winter, brought into the laboratory and placed in stacking dishes (Braun No. 25405) in a constant temperature room (air temperature 25.0°C). Since I had found, from previous investigation, the sex ratio to be approximately 1, I made no effort to sex the collected individuals. The dishes were furnished with *Elodea canadensis* Michx., to provide an egg-laying site for the insects. They were allowed to remain in these dishes for 24 hours after egg-laying began.

The stacking dishes were constantly illuminated with 50-watt light bulbs (Champion) held in gooseneck lamps (Richman) during the experiment. The light intensity was held between 750 and 1,000 microamperes, averaging approximately 850 microamperes, and was determined with a General Electric photocell (PV 1) mounted in a block of wood (13.1 cm × 13.3 cm × 1.9 cm) attached to a microammeter (Simpson Electric Co., Model 374). This was done to eliminate two possible variables, the light intensity and the temperature of the water resulting from the heat of the bulbs. A water depth of 5½ cm was maintained in the dishes.

Observations were made nightly, the water temperature recorded, and any developmental changes noted.

The nymphal instars and the adults were fed a constant diet of brine shrimp, *Artemia salina* (Linnaeus).

Life Cycle

The life cycle of *N. hoffmanni* under laboratory conditions and in-

formation on the lengths of the preoviposition and oviposition periods are given below.

The durations of the developmental stages were found to be: egg—12 to 13 days; first-instar nymph—5 to 9 days; second-instar nymph—6 to 9 days; third-instar nymph—7 to 10 days; fourth-instar nymph—9 to 12 days; fifth-instar nymph—15 to 21 days. The means for these periods were 12.80, 7.82, 8.14, 8.25, 11.22, and 18.00 days, respectively. Fertilized eggs were found 27 days after the emergence of the adults.

Thirty adults (male and female) were collected from Viejas Creek on 25 March 1964, brought into the laboratory, and placed in the constant temperature room. During the life cycle, the water temperature varied between 23.0° and 26.0°C.

26 March: Oviposition began with approximately 65 eggs being laid; nearly 100% were fertile.

29 March: About 50% of the eggs had begun to darken and during the following 2 days, all turned dark brown.

1 April: The eyespots appeared on a few of the eggs as pink vertical bars at the broad end.

3 April: The eyespots had become red and prominent. There was no further change observed until hatching except for the increasing visibility of the first-instar nymph through the chorion.

7 April: A total of 12 eggs hatched followed by the appearance of 48 additional first-instar nymphs the next day. Hatching begins with the formation of a dorsoventral slit at the cephalic (widest) end of the egg. The head can be seen moving rhythmically at this time. This is followed by body contractions of the nymph as it emerges through the ventral side of the cephalic end in a jerky manner. An embryonic (vitelline) membrane surrounding the nymph is now visible. The nymph immediately frees itself from this membrane, the metathoracic legs being the last to leave.

12 to 16 April: One second-instar nymph appeared on the first day and 38 additional specimens during the following days of this period; the majority (19) emerged on 15 April.

18 April: Two third-instar nymphs emerged.

19 April: Six specimens died in the molting process from the second- to the third-instar nymph stage. Cause of death was probably cannibalism. Two additional third-instar nymphs did emerge successfully.

20 and 21 April: A total of 18 third-instar nymphs appeared with the majority (16) emerging on 21 April.

22 to 24 April: Five of the third-instar nymphs died, cause unknown.

25 to 28 April: Two fourth-instar nymphs were observed on the first

day of this period and by the last day a total of 12 had emerged. The greatest number (6) appeared on 26 April.

4 to 7 May: One fifth nymphal instar emerged on the first day of this period and during the next three days, eight additional specimens appeared. The majority (5) emerged on May 7.

18 May: One fifth-instar nymph was killed by cannibalism.

19 to 25 May: Seven adults emerged during this time. They were all red in color, this possibly resulting from their constant diet of brine shrimp. In the natural environment, the adults vary in color from a light tan to a brownish black. It is possible, therefore, that this variation in color may be due to slightly different diets.

14 June: Two females and one male were still alive, the others having died of unknown causes.

15 June: Oviposition began; a total of 17 eggs were laid by the females who were in two separate containers. The male was moved every few days from one container to the other.

29 June: A total of 145 eggs had been laid by the two females; the majority were fertile. The temperature varied between 23.0° and 25.8°C during the preoviposition and oviposition periods, averaging 24.5°C.

Summary

In the laboratory the durations of the developmental stages of *Notonecta hoffmanni* were found to be: egg—12 to 13 days; first-instar nymph—5 to 9 days; second-instar nymph—6 to 9 days; third-instar nymph—7 to 10 days; fourth-instar nymph—9 to 12 days; and fifth-instar nymph—15 to 21 days. The means of these periods were, respectively, 12.80, 7.82, 8.14, 8.25, 11.22, and 18.00 days. Oviposition began 27 days after the emergence of the adults.

Literature Cited

Hungerford, H. B. 1925. *Notonecta hoffmani* [sic] sp. n. Canadian Entomol., 57: 241.

McPherson, J. E. 1965. Notes on the life history of *Notonecta hoffmanni* (Hemiptera : Notonectidae). Pan-Pac. Entomol., 41: 86–89.

Sailer, R. I. 1942. Distributional record for *Notonecta hoffmanni* Hungerford 1925. Jour. Kansas Entomol. Soc., 15: 6.